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action for a cleaner tomorrow

Waste Reduction, Reuse & Recycling

Local Solutions & Global Impact

Energy Resources & Conservation

Water Quality & Conservation

Excerpts from the South Carolina Environmental Curriculum Supplement

About 'Action' ...

Action for a cleaner tomorrow: A South Carolina Environmental Curriculum Supplement ("Action") was created by a statewide team of teachers and other educational professionals in conjunction with DHEC and the S.C. Department of Education. This publication is the 18th revised edition with new lessons and resources.

Originally developed to provide an introduction to waste reduction, recycling and composting for K-12 students, "Action" has grown into an award-winning, interdisciplinary, activity-based resource and evolved since its introduction in 1993. It now includes lessons on air, water, litter prevention, natural resources, energy conservation and sustainability. Why? The waste each of us generates at home, work and school is connected to the use of natural resources and energy as well as air, land and water pollution.

"Action" is designed to provide teachers the tools and resources to bring the environment into the classroom.

- **Each of the 22 lessons are correlated to the S.C. Academic Standards and Performance Indicators for Science.** To view the standards, visit **www.ed.sc.gov/instruction/standards-learning/science/standards**.
- **Each lesson is reviewed by DHEC staff, subject matter experts, as well as education and curriculum specialists** to ensure accurate information and proper alignment to the current standards. Several lessons were piloted by teachers and revised based on their feedback.
- **Each lesson includes background information for teachers, student activities, web-based links to videos and additional information** as well as the science standards for the appropriate grade level. Visit **www.takeactionsc.org/curriculum** for quick links and resources.
- **When possible, lessons plans are customized to include South Carolina-specific information.** This unique component brings nationwide environmental issues home to the student.

"Action" is offered across South Carolina through teacher workshops and classroom presentations – both provided at no charge. Teachers must complete an "Action" workshop to get the curriculum supplement. Learn more at **www.takeactionsc.org/workshops** or call **1-800-768-7348**.

In March 2020, schools across South Carolina closed their doors due to the COVID-19 pandemic. Teachers quickly turned to virtual teaching methods in order to provide remote learning opportunities for their students. This approach focused on the key role that adaptability played in facilitating technology-rich lessons.

This curriculum supplement contains many lessons that are easily adapted to a virtual format. You will notice this e-learning symbol throughout the curriculum highlighting specific activities, evaluations, and/or extension activities that are well suited for a virtual format.

GOALS OF 'ACTION'

The overall goal of "Action" is to inform, inspire and empower students to protect and preserve the environment and take actions for a cleaner tomorrow. To meet that goal, the curriculum supplement seeks to:

- **Introduce and explain behaviors such as recycling, composting, reducing food waste and smart buying habits** that conserve natural resources, reducing pollution and their environmental footprint at home, school or in the community;
- **Help students meet S.C. Science standards and performance indicators** through critical thinking while analyzing their own actions and the results of those actions;
- **Help students understand the concept of personal responsibility and sustainability**;
- **Protect students' health through increased awareness of the safe use, storage and disposal of household products** that contain hazardous material.

ACKNOWLEDGMENTS

The S.C. Solid Waste Policy and Management Act of 1991 – S.C. Code of Laws § 44-96-110 – requires that DHEC provide a curriculum and resource material on recycling for instruction at the elementary, middle and high school levels.

DHEC's Office of Solid Waste Reduction and Recycling (Office) is charged with this responsibility and as part of that obligation to consult with the S.C. Department of Education in the development and offering of these resources. "Action" is published by DHEC's Bureau of Land and Waste Management (BLWM).

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SPECIAL THANKS

The development and revisions of "Action" have involved education, environmental and communications professionals from across South Carolina. The Office would like to thank all of the educators who served on the curriculum development team and as pilot testing teachers.

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The Office also extends a special thanks to the following people for the revision of this edition.

LESSON REVISIONS – CORRELATION TO THE S.C. SCIENCE STANDARDS

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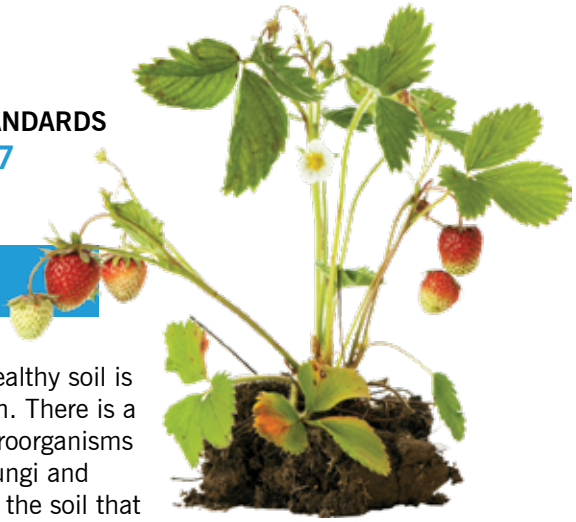
An Excerpt from

Healthy Soil

Aligned to the
2014 S.C. SCIENCE STANDARDS
GRADES 5 & 7



Learning Objectives

Students will:

- **Define soil**;
- **Understand that soil is an essential natural resource**;
- **Understand that soil is an ecosystem**; and
- **Discuss why soil needs to be healthy**.

BACKGROUND

Soil is a living and life-giving natural resource. It is an ecosystem comprised of air, water, minerals (e.g., clay, silt, sand) and organic matter that provides essential services for life such as providing a foundation to build structures and grow food. Healthy soil provides clean air and water, crops and forests, grazing lands, diverse wildlife and picturesque landscapes according to the U.S. Department of Agriculture (USDA). Soil does this through five indispensable functions.

1. **Regulates water** – Soil helps control where rain, snowmelt and irrigation water go.
2. **Sustains plant and animal life** – The diversity and productivity of living things depend on soil.
3. **Filters and buffers potential pollution** – The minerals and microbes in soil are responsible for filtering, buffering, degrading, immobilizing and detoxifying organic and inorganic material including industrial and municipal byproducts and atmospheric deposits.
4. **Cycles nutrients** – Carbon, nitrogen, phosphorus and many other nutrients are stored, transformed and cycled in soil.
5. **Provides physical stability and support** – Soil structure provides a medium for plant roots. Soil also provides support for human structures and protection for archaeological treasures.

The ground beneath our feet is an ecosystem – that is a biological community of interacting organisms and their physical environment. An ecosystem contains both living (biotic) and non-living (abiotic) elements. Healthy soil is an ecosystem. There is a world of microorganisms – bacteria, fungi and protozoa - in the soil that cannot be seen without a microscope. There are also bugs that we can see like ants, beetles, worms, millipedes and more. These organisms use the soil as their home while playing a vital role in the breakdown of organic material and supporting the balance of the ecosystem.

The organic material is called soil organic matter (SOM). SOM is composed of humus, mature or well-decomposed leaves and old plant material that is no longer part of the living plant, actively decomposing material and living roots and organisms. The materials sand, silt and clay are the non-living material in the soil. Sand, silt and clay are all different sized particles. In your examination of the soil types, see if you can see the fine silt and clay and sand pieces. When a soil has a healthy level of organic matter, about 10 percent of the soil makeup, there is enough organic material for the microorganisms to thrive. With microbial activity, soil aggregates form. Soil aggregates are groups of particles in the soil that bind together. The space that is made in between the groups of particles allows for air and water in a balanced soil makeup.

What is most important to remember is that a healthy soil ecosystem is essential for healthy plant life. The soil and living plants share an environment together and help each other live. When the microorganisms in the soil break down decaying material, this makes the minerals and nutrients available to the plant's roots. In exchange, the plant roots give the microorganisms something important to their makeup. The plant roots transfer carbon to the microorganisms which they retrieve from the air through photosynthesis. This exchange and transfer of material is an example of the complimenting cycles in nature positively benefiting each other.

With healthy soil, plants can be healthy. When plants are healthy, they can grow healthy food for us full of vitamins and nutrients to support our health.

ON THE WEB

The Living Soil Beneath Our Feet – https://youtu.be/MIREaT9hFCw

USDA's Helping People Understand Soils and Plants – www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/

Ecology: Soil Properties – https://youtu.be/DHXP3d_o5QQ

SUPPLY LIST (FLOUR VS. BREAD)

White flour (gluten-free substitute flour is okay), about 1 cup for each group

Sliced bread, 2-3 slices for each group

Paper cups (any size, but smaller is better so water is not overdone), two for each group (Make sure you can poke holes in them.)

Water for each group – in water bottle or second cup

Toothpicks or unfolded paper clips (to poke small holes in cups) – This is to simulate rain.

Large plastic plates, two for each group (Make sure there is room to leave space around the bread for water to flow without dripping off the edge.)

DEMONSTRATION ACTIVITY

FLOUR VS. BREAD

The teacher will need to gather material for this experiment ahead of time. See the SUPPLY LIST for this activity.

- **Step 1:** In groups, have the students poke 5-10 holes in the bottom of 1 cup using the toothpicks or unfolded paper clips.
- **Step 2:** Have the students pour flour in a cone-like mountain on the plate. The flour represents soil. The substrate of soil is broken down rocks referred to as SAND, SILT and CLAY.
- **Step 3:** Have one student hold the cup with holes, the rain cloud, over the flour and another student pour water into it so that water rains down on the pile of flour. Ask the following questions. *What is happening? Is the water soaking into the flour? Where is the water going? What effect is the water having on the flour?* (Erosion) *If the flour was soil, would the rain reach the roots of the plants? Why do you think the soil (flour) moved with the flow of the water?*
- **Step 4:** On the second plate, place the slice of bread. This is healthy, living soil.
- **Step 5:** Using the same cups, have one student hold the "rain cloud" over the bread, and another student pour water into it so that water rains down onto the bread. Ask these questions. *What is happening? Is it running off? Is the bread absorbing the water? If the bread was soil, would the rain reach the roots of the plants? Why do you think the water entered the soil (bread) more easily this time and stayed put?* Point out that the porous and airy texture of the bread is similar

Kris Abell from Take Action SC demonstrates the Flour vs. Bread activity during a virtual classroom presentation.

to a sponge. This is what healthy aggregated soil resembles and gives it the ability to maintain healthy amounts of water and air in the soil structure.

- **Step 6:** After examining the bread while on the plate, pick it up and gently squeeze it to view the water present. *Ask students what they observed when they squeezed the bread.* Explain how this resembles the water retention and potential nutrient retention occurring in healthy balanced soil.
- **Step 7:** (Optional) Demonstrate on one group's flour pile and bread a pouring of water straight from the water bottle or cup in a steady stream to imitate flood conditions. The results on the flour pile and bread will be the same. Remind students that this is what happens during prolonged rain storms and other natural disasters.

MORE RESOURCES

Below is a list of additional teacher resources.

- **Soil Microorganisms** – www.sare.org/Learning-Center/Books/Building-Soils-for-Better-Crops-3rd-Edition/Text-Version/The-Living-Soil/Soil-Microorganisms
- **The Soil Story Curriculum** – https://kisstheground.com/soil_story_curriculum/
- **Soil Organic Matter** – http://franklin.cce.cornell.edu/resources/soil-organic-matter-fact-sheet
- **Flour vs. Bread: How Soil Aggregate Structure Influences Water Flows** – https://soilcarboncoalition.org/learning/Flour-and-Water-INVESTIGATION.pdf
- **Ecology: Soil Properties** – https://youtu.be/DHXP3d_o5QQ
- **The Soil Story with Pashon Murray** – https://youtu.be/npu6GBbB-Oc

S.C. Science Standards for Grades 5 & 7

STANDARDS	
5.L.4	The student will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems.
7.EC.5	The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.
CONCEPTUAL UNDERSTANDING	
5.L.4B.	All organisms need energy to live and grow. Energy is obtained from food. The role an organism serves in an ecosystem can be described by the way in which it gets its energy. Energy is transferred within an ecosystem as organisms produce, consume, or decompose food. A healthy ecosystem is one in which a diversity of life forms are able to meet their needs in a relatively stable web of life.
7.EC.5A.	In all ecosystems, organisms and populations of organisms depend on their environmental interactions with other living things (biotic factors) and with physical (abiotic) factors (such as light, temperature, water, or soil quality). Disruptions to any component of an ecosystem can lead to shifts in its diversity and abundance of populations.
PERFORMANCE INDICATORS	
5.L.4B.1	Analyze and interpret data to explain how organisms obtain their energy and classify an organisms as producers, consumers (including herbivore, carnivore, and omnivore), or decomposers (such as fungi and bacteria).
7.EC.5A.2	Construct explanations of how soil quality (including composition, texture, particle size, permeability and pH) affects the characteristics of an ecosystem using evidence from soil profiles.
SCIENCE AND ENGINEERING PRACTICES	
S.1A.6	Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements or (4) data communicated in graphs, tables or diagrams.

An Excerpt from

Composting: Recycling Naturally

Learning Objectives

Students will:

- **Understand the basics of composting**;
- **Discuss how organic waste can be recycled by composting**;
- **Observe how composting works**;
- **List the benefits of composting**; and
- **Understand the indispensable importance of soil in our lives**.

BACKGROUND

Composting is nature's way of recycling. It is the natural decomposition of organic material such as food, yard and animal waste into a nutrient-rich soil amendment known as **compost**.

Composting happens without human intervention when, for example, leaves and limbs break down on the forest floor replenishing nature by returning nutrients to plants and trees. Composting also is a practice that can be done on a small scale indoors, in the backyard, at school, by an organization or business. In addition, it can be done on a large scale by permitted commercial composters as a multi-step, closely monitored process with measured inputs of material. These types of composting accelerate the natural decay of organic material by providing ideal conditions for the process to occur.

How does it work? Microorganisms in the soil eat the organic waste, break it down into its simplest parts and produce a valuable product with economic and environmental benefits. There are, however, specific recipes depending on the type of composting (small- or large-scale) selected, but in its most fundamental form composting requires:

- **Organic waste** – that is nitrogen-rich **greens**, carbon-rich **browns**. Examples of greens are green leaves, coffee grounds and filters, tea bags, plant trimmings, fruit and vegetable waste, eggshells and fresh grass clippings. Examples of browns are dead plants, twigs, dried grass, weeds, straw and brown leaves.
- **Soil** – the source of microorganisms;
- **Air** – the source of oxygen for the microorganisms; and
- **Water** – which allows microorganisms to grow.

The finished product – compost – is a valuable product beneficial in many ways to soil. Soil is a living and life-giving natural resource. It is an ecosystem comprised of air, water, minerals (e.g., clay, silt, sand) and organic matter that provides essential services for life such as providing a foundation to build structures and grow food. Compost is used in gardens, on landscapes and in farming and:

- **Contains an assortment of nutrients** necessary for plant growth;
- **Enriches soil** helping retain moisture and suppress plant diseases and pests;

Aligned to the
2014 S.C. SCIENCE STANDARDS
GRADES 1, 3, 5 & 7

DID YOU KNOW?

It is essential for students to know that soil is one of the most valuable abiotic factors in an ecosystem. Soil has an effect on the types of plants that can grow in an ecosystem – which directly impacts the types of other organisms that can survive there. If a change in the properties of soil occurs, the ecosystem (including biotic and abiotic factors) will also change. Soil quality is based on properties that can be observed in the soil profile and composition.

SOIL PROFILE

- A mature soil profile consists of three layers – topsoil, subsoil and parent material above bedrock.
- Topsoil that is nutrient-rich contains a mixture of humus, clay and minerals and is most suitable for plant growth.
- Most animals live in the topsoil.

COMPOSITION

- Soil is a mixture of rock particles, minerals, decayed organic material, air and water.
- Decayed organic matter in soil is humus.
- The sand, silt, and clay portion of soil comes from weathered bedrock material.
- The combination of these materials in soil determines the soil type and affects the types of plants that can grow in it or animals that can live in it. Factors that may affect soil type are climate, time and slope of the land.

- **Improves the ability of sandy soil to hold moisture and resist erosion**;
- **Improves drainage** in clay soil;
- **Assists in land and stream reclamation and wetlands construction**; and
- **Reduces the need for chemical fertilizers and pesticides** and helps protect the environment by decreasing potential runoff pollution.

Composting is an important strategy to reduce the nation's municipal solid waste (MSW) - waste created at home, work and school. Food waste comprised 28.3 percent (measured by weight) of the country's MSW in 2017 according to the U.S. Environmental Protection Agency (EPA). Composting keeps it out of the landfill and turns it into a safe and valuable product.

There's another benefit. When food waste goes to the landfill, it's similar to tying food in a plastic bag. The nutrients never return to the soil and the food waste rots and produces methane - a greenhouse gas. Consequently, MSW landfills are the third largest source (about 15 percent) of human-related methane emissions in the United States according to the EPA. Keeping food waste out of the landfill reduces those emissions.

DEMONSTRATION ACTIVITY

COMPOST IN A BOTTLE

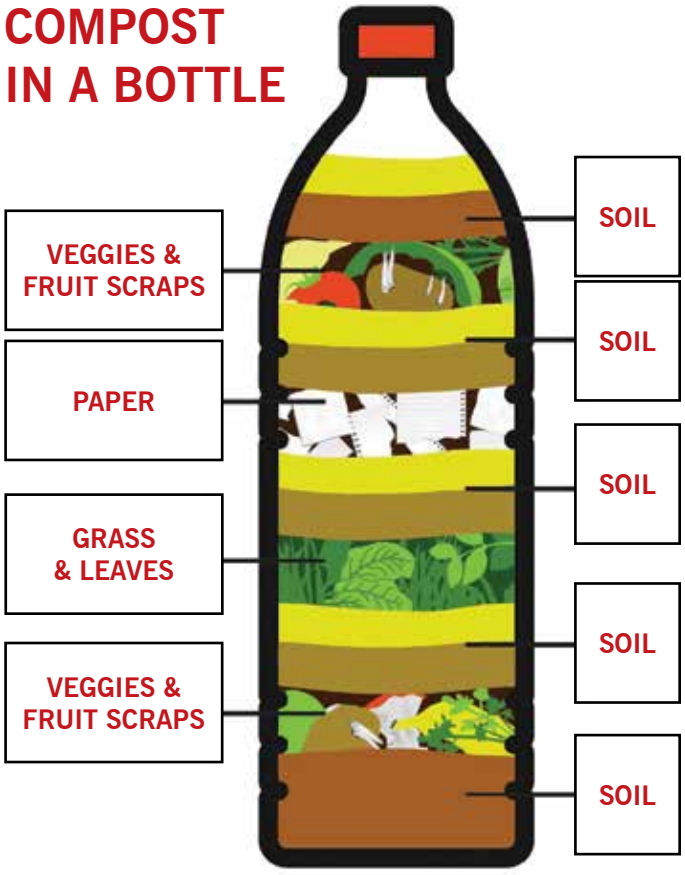
As a class project, build a mini-composter. See the SUPPLY LIST. Use this activity as a demonstration lab for the class to view composting at work. The teacher should collect the material (including greens and browns) to use in the mini-composter prior to the lesson to expedite demonstration. Explain to the students that they will be able to view composting in the classroom on a small scale.

SUPPLY LIST

- Clear 2-Liter Plastic Soda Bottle
- Cup of Grass Clippings and Leaves
- Spray Bottle Containing Water
- 2 Cups of Fruit and Vegetable Waste (chopped in small pieces)
- Cup of Dirt
- Cup of Shredded Newspaper
- Spoons (for the soil, scraps, leaves, grass, etc.)
- Tape
- Scissors

Show the students the material collected.

- **STEP 1:** Remove the label from the soda bottle, leave on the lid and cut around the bottle about three-fourths of the way up to form a flip top. Don't cut it off! Teachers may need to do the cutting depending on the ages of the students.
- **STEP 2:** Fold the flip top back on the bottle to fill it as detailed in the following steps.
- **STEP 3:** In the bottom of the bottle, place 1 inch of soil. Do not compact the soil. If it is dry, lightly spray with water.
- **STEP 4:** Add a thin layer of fruit and vegetable waste. Cover with a thin layer of soil. Add a layer of leaves and grass or shredded newspaper.
- **STEP 5:** Layer material in the same way until the bottle is about full.
- **STEP 6:** Use scissors to carefully poke dozens of air holes in the top portion of the bottle. Mark with a permanent marker the height of the compost on the bottle.
- **Step 7:** Put in a sunny spot (e.g., on a window sill).
- **Step 8:** Gently shake the bottle every day to circulate the material.



- **Step 9:** If it gets too moist take the lid off to help dry it a little bit.
- **STEP 10:** If it gets too dry spray a little water.
- **STEP 11:** For the next 4-12 weeks (depending on bottle size and material added), shake the bottle once daily to mix the soil and food scraps, being careful not to spill the contents. This represents the turning that would ordinarily occur in a backyard compost pile and allows air and moisture to circulate through the soil and scraps.

Have the students make observations of the mini-composter for the next 12 weeks. Use these questions to begin a quick discussion each day.

- *Is the food decomposing? Why or why not?*
- *What would happen if the bottle were not shaken?*
- *What would happen if there were no air holes in the bottle?*
- *Why was the soil added?*

SOURCE: **https://bkc.vmhost.psu.edu/documents/Activities1501.pdf**

EVALUATE

SUGGESTED FOR GRADES K-1

Create a T Chart with pictures of items that can and cannot be composted. Using ***Composting in a Bottle***, set up a classroom investigation changing one variable in the activity. Have the students select one variable to test against the controlled compost bottle – the original plastic bottle. Variable conditions that could be changed include: 1) items that can be COMPOSTED, 2) items that can't be composted but can be RECYCLED and 3) items that CAN NOT BE COMPOSTED OR RECYCLED.

SUGGESTED FOR GRADES 3 & 5

Complete a similar activity. Third graders can use a Venn Diagram to find, evaluate and sort pictures into RECYCLE (first circle), COMPOST (second circle), EITHER (both) and TRASH/LANDFILL (area outside the circles). Allow the students to share their Venn Diagrams with the class or with partners.

SUGGESTED FOR GRADE 7

1. Using the ***Composting in a Bottle*** activity, design a classroom investigation changing one variable. The students will choose one variable to test against the controlled compost bottle – the original plastic bottle that was created with a good combination of GREENS/BROWNS/WATER/AIR. Some variable conditions that could be changed are listed below.
   - LOW IN NITROGEN OR NO HIGH-NITROGEN MATERIAL
     - Keep it moist, but mainly a brown pile.
   - NOT ENOUGH MOISTURE
     - Don't add water and exclude wet components.
     - Use a mixture of brown and green material.
   - NO AIR (ANAEROBIC)
     - Use a bottle without holes.
     - Do not turn and keep it moist. Use a mixture of brown and green material.
   - HIGH IN NITROGEN
     - Don't add carbon material.
     - Make it mainly a green pile (vegetable waste).
2. Keep a daily record of the temperature of each pile (optional).
3. After three or four weeks, discuss the results. Ask the following questions.
   - *What are the necessary components of a good pile?*
   - *How do the components of a compost pile work together to decompose material?*
   - *How is recycling within the compost pile like the nitrogen cycle and other natural cycles in our biosphere?* (The nitrogen cycle is the continuous, cyclic progression of chemical reactions in which atmospheric nitrogen is compounded, dissolved in rain, deposited in the soil, assimilated and metabolized by bacteria and plants and returned to the atmosphere by organic decomposition.)

FOR ALL GRADES

After completing the lesson, have students answer these questions in their science journal.

- *Why compost?*
- *What can be composted?*
- *What cannot be composted?*
- *How could a compost system work in the classroom?*
- *How could composting work in the cafeteria?*

SOURCE: This lesson presentation was taken in part from ©2010 Wake County Environmental Services, Solid Waste Management Division, Raleigh, NC.

What goes in your backyard compost?

CARBON MATERIALS (Browns)	NITROGEN MATERIALS (Greens)
Shredded cardboard	Bread & grains
Dryer and vacuum cleaner lint	Coffee grounds & paper filters
Crushed egg shells	Fruits (cooked or uncooked – limit citrus)
Fireplace or wood ash (no coal ash)	Green grass clippings
Hay and straw	Green leaves
Pinestraw (small amounts)	Green shrub prunings
Nut shells	Hair and fur
Household plants and used potting soil	House plants
Old brush, shrub trimmings and prunings	Kelp or seaweed
Paper towels and towel rolls	Manure from chickens, rabbits, cows, horses (herbivores)
Saw dust and wood chips (untreated)	Old flowers
Shredded newspaper	Tea bags (with tags)
Yard trimmings (dry leaves, clippings and twigs)	Vegetables (cooked or uncooked)

NOTE: Always mix food waste into the middle of the pile to avoid odors and pests.

DO NOT COMPOST THESE ITEMS IN BACKYARD BINS!		
Coal ash from briquettes	Glass	Plastic
Dairy products	Meat, bones or seafood scraps	Treated or painted wood
Diseased or infected plants	Metal	Trimmings toxic to other plants (e.g., black walnut, hemlock)
Dog, cat or human waste	Oils, fats, grease or lard	Weeds, roots or seeds

QUICK TIPS

FOR REDUCING FOOD WASTE AT HOME

1. Plan ahead.
Create a meal plan based on items you already have at home.

2. Shop smart.
Make a list of items you still need and stick to it.

3. Understand the labels.
"Sell by," "use by" and "best by" are not expiration dates. Take a smell test to see if items are still good to eat.

4. Prep right.
Prep and portion food when you get home from the store.

5. Only cook what you'll eat.
Plan accordingly for your family or guests unless you love leftovers.

6. Be creative. Use leftover meals to make new meals.

7. Store correctly.
Your fridge should be 40°F and your freezer should be 0°F. Make sure to put the older items up front so they get used first.

LOVE YOUR FOOD!

DON'T WASTE FOOD SC
PREVENT • DONATE • COMPOST

dhec

www.scdhec.gov/dontwastefoodsc

DID YOU KNOW?

Why compost at school? Composting offers a variety of benefits from classroom projects to school-wide programs including:

- **Reducing the amount of waste a school creates.** Organics such as yard trimmings, food waste and non-recyclable paper (e.g, napkins, paper towels) make up a significant portion of a school's waste stream. Schools can divert this material from the landfill and potentially avoid disposal costs;
- **Providing opportunities for hands-on learning**;
- **Enhancing curriculum-based learning** – these projects or programs support lessons in science, chemistry, mathematics, economics and more; and
- **Empowering and encouraging students to be aware of and lessen their environmental impact**.

MORE RESOURCES

For information about starting a school composting program, see ***Composting: A Guide for SC Schools***. DHEC's ***Composting: Simple Steps for Starting at Home***. Both guides are available at www.scdhec.gov/compost.

The first week of May is ***International Compost Awareness Week***. Please visit www.fao.org/world-soil-day to learn more about events and ways to participate and download a free poster.

ON THE WEB

See Highfields Center for Composting's ***Animated Teaching Guide*** – https://youtu.be/dRXNo7Ieky8. Students will learn about compost, the importance of closing the loop on their food system and how to separate food waste.

Watch ***Jason Mraz & Alison Teal Discussing Compost and Regenerative Agriculture – Kiss The Ground*** – https://youtu.be/6Hy1_6ACE0A. Alison Teal visits Mraz Family Farms and talks compost and regenerative agriculture with the Grammy-winning artist.

Learn more about ***Composting with Worms*** at www.shareitscience.com/2016/03/composting-with-worms-environmental-activity-home-school.html.

S.C. Science Standards for Grades K, 1, 3, 5 & 7

STANDARDS	
K.L.2	The student will demonstrate an understanding of organisms found in the environment and how these organisms depend on the environment to meet those needs.
1.E.4	The student will demonstrate an understanding of the properties and uses of Earth's natural resources.
1.L.5	The student will demonstrate an understanding of how the structures of plants help them survive and grow in their environments.
3.E.4	The student will demonstrate an understanding of the composition of Earth and the processes that shape features of Earth's surface.
3.L.5	The student will demonstrate an understanding of how the characteristics and changes in environments and habitats affect the diversity of organisms.
5.L.4	The student will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems.
5.E.3	The student will demonstrate an understanding of how natural processes and human activities affect the features of Earth's landforms and oceans.
7.EC.5	The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.
CONCEPTUAL UNDERSTANDING	
K.L.2A	The environment consists of many types of organisms including plants, animals and fungi. Organisms depend on the land, water, and air to live and grow. Plants need water and light to make their own food. Fungi and animals cannot make their own food and get energy from other sources. Animals (including humans) use different body parts to obtain food and other resources needed to grow and survive. Organisms live in areas where their needs for air, water, nutrients and shelter are met.
1.E.4B.	Natural resources are things that people use that come from Earth (such as land, water, air, and trees). Natural resources can be conserved.
1.L.5B.	Plants have basic needs that provide energy in order to grow and be healthy. Each plant has a specific environment where it can thrive. There are distinct environments in the world that support different types of plants. These environments can change slowly or quickly. Plants respond to these changes in different ways.
3.E.4A.	Earth is made of material (including rocks, minerals, soil, and water) that have distinct properties. These material provide resources for human activities.
3.E.4B.	Earth's surface has changed over time by natural processes and by human activities. Humans can take steps to reduce the impact of these changes.
3.L.5A.	The characteristics of an environment (including physical characteristics, temperature, availability of resources or the kinds and numbers of organisms present) influence the diversity of organisms that live there. Organisms can survive only in environments where their basic needs are met. All organisms need energy to live and grow. This energy is obtained from food. The role an organism serves in an ecosystem can be described by the way in which it gets energy.
3.L.5B.	When the environment or habitat changes, some plants and animals survive and reproduce, some move to new locations and some die. Fossils can be used to infer characteristics of environments from long ago.
5.E.3B.	Earth's oceans and landforms can be affected by natural processes in various ways. Humans cannot eliminate natural hazards caused by these processes but can take steps to reduce their impacts. Human activities can affect the land and oceans in positive and negative ways.
5.L.4B.	All organisms need energy to live and grow. Energy is obtained from food. The role an organism serves in an ecosystem can be described by the way in which it gets its energy. Energy is transferred within an ecosystem as organisms produce, consume, or decompose food. A healthy ecosystem is one in which a diversity of life forms are able to meet their needs in a relatively stable web of life.
5.L.4B.1	Analyze and interpret data to explain how organisms obtain their energy and classify an organisms as producers, consumers (including herbivore, carnivore, and omnivore) or decomposers (such as fungi and bacteria).
7.EC.5A	In all ecosystems, organisms and populations of organisms depend on their environmental interactions with other living things (biotic factors) and with physical (abiotic) factors (such as light, temperature, water or soil quality). Disruptions to any component of an ecosystem can lead to shifts in its diversity and abundance of populations.

PERFORMANCE INDICATORS	
K.L.2A.2	Conduct structured investigations to determine what plants need to live and grow (including water and light).
1.E.4B.2	Obtain and communicate information to explain ways natural resources can be conserved (such as reducing trash through reuse, recycling or replanting trees).
1.L.5B.1	Conduct structured investigations to answer questions about what plants need to live and grow (including air, water, sunlight, minerals and space).
3.E.4A.1	Analyze and interpret data from observations and measurements to describe and compare different Earth material (including rocks, minerals and soil) and classify each type of material based on its distinct physical properties.
3.E.4A.3	Obtain and communicate information to exemplify how humans obtain, use and protect renewable and nonrenewable Earth resources.
3.E.4B.3	Obtain and communicate information to explain how natural events (such as fires, landslides, earthquakes, volcanic eruptions or floods) and human activities (such as farming, mining or building) impact the environment.
3.E.4B.4	Define problems caused by a natural event or human activity and design devices or solutions to reduce the impact on the environment.
3.L.5A.2	Develop and use a food chain model to classify organisms as producers, consumers and decomposers and to describe how organisms obtain energy.
3.L.5B.1	Obtain and communicate information to explain how changes in habitats (such as those that occur naturally or those caused by organisms) can be beneficial or harmful to the organisms that live there.
5.E.3B.3	Construct scientific arguments to support claims that human activities (such as conservation efforts or pollution) affect the land and oceans of Earth.
5.E.3B.4	Define problems caused by natural processes or human activities and test possible solutions to reduce the impact on landforms and the ocean shore zone.
7.EC.5A.2	Construct explanations of how soil quality (including composition, texture, particle size, permeability and pH) affects the characteristics of an ecosystem using evidence from soil profiles.

Depth of Knowledge (DOK): 1, 2, 3

PRIMARY SCIENCE AND ENGINEERING PRACTICE (SEP)	
K.S.1A.6	Construct explanations of phenomena using: 1) student generated observations and measurements; 2) results of investigations; or 3) data communicated in graphs, tables or diagrams.
1.S.1A.8	Obtain and evaluate informational texts, observations, data collected or discussions to: 1) generate and answer questions about the natural world; 2) understand phenomena; 3) develop models; or 4) support explanations. Communicate observations and explanations clearly through oral and written language.
1.S.1A.3	With teacher guidance, conduct structured investigations to answer scientific questions, test predictions and develop explanations: 1) predict possible outcomes; 2) identify material and follow procedures; 3) use appropriate tools or instruments to collect qualitative and quantitative data; and 4) record and represent data in an appropriate form. Use appropriate safety procedures.
3.S.1A.8	Obtain and evaluate informational texts, observations, data collected, or discussions to: 1) generate and answer questions; 2) understand phenomena; 3) develop models; or 4) support explanations, claims or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

CONNECTED SEPS	
S.1A.1	Ask Questions
S.1A.2	Develop and use models
S.1A.3	Plan and Carry Out Investigations
S.1A.4	Analyze and Interpret Data
S.1A.5	Use Mathematical and Computational Thinking S.1A.6: Construct Explanations
S.1A.7	Engage in Scientific Argument from Evidence
S.1B.1	Construct Devices or Design Solutions

*Note Grade-Level Progressions for Science and Engineering Practices

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& Grow

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OR-2227 1/21